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(54) **Semi-automatic shift implementation**

Halbautomatische Schaltdurchführung

Réalisation semi-automatique de changement de vitesse

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a semi-automatic shift implementation control system/method for semi-automatic shifting of a splitter type, preferably a combined splitter and range type, compound transmission. More particularly, the present invention relates to a semi-automatic shift implementation control for shifting a splitter-type compound mechanical transmission wherein all splitter shifting is automatically implemented while all main section shifting is manually implemented. Preferably, if the compound transmission also includes auxiliary range gearing, range shifting is also at least partially automatically implemented.

Description of the Prior Art

Compound range-type mechanical transmissions using so-called "double H" type controls wherein a range shift is automatically selected by movement of the shift lever, without requiring the operator to use a button or lever to select a range change, are well known in the prior art as may be seen by reference to U.S. Patent Nos. 4,561,325, 4,324,153 4,455,883 and 4,944,197.

Compound mechanical transmissions of the combined splitter and range type are widely used for heavy duty vehicles and very well known in the prior art as may be seen by reference to U.S. Patent Nos. 4,754,665 and 4,944,197.

Semi-automatic shift implementation systems for compound mechanical transmissions wherein, upon manual shifting into a highest grouping of gear ratios, automatic shifting with that highest grouping only is provided are known in the prior art and disclosed in U.S. Patent Nos. 4,722,248 and 5,038,627. Semi-automatic shift implementation systems for mechanical transmissions wherein the vehicle operator is required to manually cause a torque interruption and/or achieve synchronous conditions are known in the prior art and are disclosed in U.S. Patent No. 5,053,961.

These prior art transmission systems were not suited for certain applications as they required a relatively high level of skill and experience to operate, required a significant amount of automation hardware and/or did not permit the operator to shift the transmission in a manner equivalent to shifting a passenger car manual transmission.

SUMMARY OF THE INVENTION

The features of the respective pre-characterizing portions of independent claims 1 and 3 are known from US-A-4 324 153.

In accordance with the present invention which, is described in claims 1 and 3, many of the features of the prior art are utilized in a novel manner to provide a semi-automatic shift implementation control system/method for a multi-speed compound transmission system which retains the efficiencies of a mechanical transmission, will allow such a transmission system to be provided with relatively inexpensive sensors, actuators and controls, will allow the operator to make many of the shift decisions and will allow the transmission to be shifted with the ease of a typical passenger automobile simple manual transmission.

The above is provided by providing a control system/method for a splitter type compound mechanical transmission system wherein main section ratio shifts are manually implemented, and relatively simple and inexpensive controls, sensors and actuators are provided to automate the splitter shifts for each main section ratio. Preferably, if a combined splitter and range type compound transmission is to be controlled, range shifting will be automatically selected by shift lever movement as is known in commercially available "double H" type controls.

Accordingly, it is an object and advantage of the present invention to provide a new and improved semi-automatic shift implementation system for a splitter type, or a combined splitter and range type, compound transmission which is relatively simple and inexpensive and allows the transmission to be driven in a manner similar to a simple passenger car manual transmission. These and other objects and advantages of the present invention will become apparent from a reading of the description of the preferred embodiments taken in connection with the drawings.

DESCRIPTION OF THE DRAWINGS

Figures 1 and 1A are a plan view of a combined range and splitter type compound transmission.

Figure 2 illustrates a prior art shift pattern for the transmission of Figure 1.

Figure 3 illustrates a shift pattern for the transmission of Figure 1 according to the present invention.

Figure 4 is a block diagram of a semi-automatic shift implementation transmission system according to the present invention.

Figure 5 illustrates a splitter type compound transmission.

Figure 5A illustrates a prior art control for the transmission of Figure 5.

Figure 6 illustrates the shift pattern for the transmission of Figures 5 and 5A.

Figure 7 illustrates a shift pattern for the transmission of Figure 5 according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Certain terminology will be used in the following description for convenience only and will not be limiting.

The words "upwardly", "downwardly", "rightwardly", and "leftwardly" will designate directions in the drawings to which reference is made. The words "forward" and "rearward" will refer respectively to the front and rear ends of the transmission as conventionally mounted in the vehicle, being respectfully to the left and right sides of the transmission as illustrated in Figures 1, 2, 3, 6 and 7. The words "inwardly" and "outwardly" will refer to directions toward and away from, respectively, the geometric center of the device and designated parts thereof. Said terminology includes the words above specifically mentioned, derivatives thereof and words of similar import.

The term "compound transmission " is used to designate a change speed or change gear transmission having a main transmission section and an auxiliary drive train unit, such as an auxiliary transmission section, connected in series whereby the selected gear reduction in the main transmission section may be compounded by further selected gear reduction in the auxiliary transmission section. The term "upshift" as used herein shall mean the shifting from a lower speed gear ratio to a higher speed gear ratio and the term "downshift" as used herein shall mean the shifting from a higher speed gear ratio to a lower speed gear ratio. The terms "low speed gear" or "low gear" as used herein shall designate a gear utilized for relatively lower forward speed operation in a transmission, i.e., a set of gears having a higher ratio of reduction of output shaft speed relative to the speed of the input shaft.

Figures 1 and 1A illustrate a combined range and splitter type compound transmission 10 which is especially well suited for control by the semi-automatic shift implementation control system/method of the present invention. Transmission 10 comprises a main transmission section 12 connected in series with an auxiliary transmission section 14 having both range and splitter type gearing. Typically, transmission 10 is housed within a single multi-piece housing 16 and includes an input shaft 18 driven by a prime mover such as a diesel engine (not shown) through a selectively disengaged, normally engaged, friction master clutch (not shown).

In the main transmission section 12, the input shaft 18 carries an input gear 20 for driving at least one countershaft assembly 22. Preferably, as is well known in the prior art and as is illustrated in U.S. Patent Nos. 3,105,395 and 3,335,616, input gear 20 simultaneously drives a plurality of substantially identical mainsection countershaft assemblies at substantially identical rotational speeds. Each of the mainsection countershaft assemblies comprises a mainsection countershaft 24 supported by bearings 26 and 28 in housing 16 and is provided with mainsection countershaft gears 30, 32, 34, 36 and 38 fixed thereto. A plurality of mainsection drive or mainshaft gears 40, 42 and 44 surround the transmission mainshaft 46 and are selectively clutchable, one at a time, to the mainshaft 46 for rotation therewith by sliding clutch collars 48 and 50 as is well known in the art. Clutch collar 48 may also be utilized to clutch input gear 20 to the mainshaft 46 to provide a direct drive relationship between the input shaft 18 and the mainshaft 46. Preferably, each of the mainsection mainshaft gears encircles the mainshaft 46 and is in continuous meshing engagement with and is floatingly supported by the associated countershaft gear groups, which mounting means and special advantages resulting therefrom are explained in greater detail in above-mentioned United States Patent Nos. 3,105,395 and 3,335,616. Typically, clutch collars 48 and 50 are axially positioned by means of shift forks or yokes 52 and 54, respectively, associated with a shift bar housing assembly 56 to be described in greater detail below. Clutch collars 48 and 50 are, in the preferred embodiment, of the well known non-synchronized double acting jaw clutch type.

Main section mainshaft gear 44 is the reverse gear and is in continuous meshing engagement with countershaft gears 38 by means of conventional intermediate idler gears 57 (see Fig 1A). Main section countershaft gear 32 is provided for powering power takeoff devices and the like. Jaw clutches 48 and 50 are three-position clutches in that they may be positioned in a centered axially nondisplaced, nonengaged position as illustrated or in a fully rightwardly engaged or fully leftwardly engaged position.

Auxiliary transmission section 14 is connected in series with main transmission section 12 and is of the three-layer, four speed combined splitter/range type as illustrated in above-mentioned United States Patent No. 4,754,665. Mainshaft 46 extends into the auxiliary section 14 and is journaled in the inward end of the output shaft 58 which extends from the rearward end of the transmission.

Auxiliary transmission section 14 includes, in the preferred embodiment thereof, a plurality of substantially identical auxiliary countershaft assemblies 60 (see Figure 1A) each comprising an auxiliary countershaft 62 supported by bearings 64 and 66 in housing 16 and carrying three auxiliary section countershaft gears 68, 70 and 72 fixed for rotation therewith. Auxiliary countershaft gears 68 are constantly meshed with and support auxiliary section splitter gear 74. Auxiliary countershaft gears 70 are constantly meshed with and support auxiliary section splitter/range gear 76 which surrounds the output shaft 58 at the end thereof adjacent the coaxial inner end of mainshaft 46. Auxiliary section countershaft gears 72 constantly mesh with and support auxiliary section range gear 78 which surrounds the output shaft 58. Accordingly, auxiliary section countershaft gears 68 and splitter gear 74 define a first gear layer, auxiliary section countershaft gears 70 and splitter/range gear 76 define a second gear layer and auxiliary section countershaft gears 72 and range gear 78 define a third layer, or gear group, of the combined splitter and range type auxiliary transmission section 14.

A sliding two-position jaw clutch collar 80 is utilized

to selectively couple either the splitter gear 74 or the splitter/range gear 76 to the mainshaft 46 while a two-position synchronized clutch assembly 82 utilized to selectively couple the splitter/range gear 76 or the range gear 78 to the output shaft 58. The structure and function of double-acting jaw clutch collar 80 is substantially identical to the structure and function of the sliding clutch collars 48 and 50 utilized in the main transmission section 12 and the function of double-acting synchronized clutch assembly 82 is substantially identical to the structure and function of prior art double-acting synchronized clutch assembly, examples of which may be seen by reference to United States Patent Nos. 4,462,489; 4,125,179 and 2,667,955. The synchronized clutch assembly 82 illustrated is of the pin-type described in above-mentioned U.S. Patent No. 4,462,489.

The splitter jaw clutch 80 is a two-position clutch assembly which may be selectively positioned in the rightwardmost or leftwardmost positions for engaging either gear 76 or gear 74, respectively, to the mainshaft 46. Splitter jaw clutch 80 is axially positioned by means of a shift fork 84 controlled by a two-position piston actuator 86 which is operable by a driver selection switch such as a button or the like on the shift knob (not shown) as is known in the prior art. Two-position synchronized clutch assembly 82 is also a two-position clutch which may be selectively positioned in either the rightwardmost or leftwardmost positions thereof for selectively clutching either gear 78 or 76, respectively, to output shaft 58. Clutch assembly 82 is positioned by means of a shift fork 88 operated by means of a two-position piston device 90, the actuation and control of which will be described in greater detail below.

As may be seen by reference to Figures 1 - 2, by selectively axially positioning both the splitter clutch 80 and the range clutch 82 in the forward and rearward axial positions thereof, four distinct ratios of mainshaft rotation to output shaft rotation may be provided. Accordingly, auxiliary transmission section 14 is a three layer auxiliary section of the combined range and splitter type providing four selectable speeds or drive ratios between the input (mainshaft 46) and output (output shaft 58) thereof. The mainsection 12 provides a reverse and three potentially selectable forward speeds. However, one of the selectable mainsection forward gear ratios, the low speed gear ratios associated with mainshaft gear 42, is not utilized in the high range. Thus, transmission 10 is properly designated as a "(2 + 1) X (2X2)" type transmission providing nine or ten selectable forward speeds, depending upon the desirability and practicality of splitting the low gear ratio. While clutch 82, the range clutch, should be a synchronized clutch, double acting clutch collar 80, the splitter clutch, is not required to be synchronized.

According to the prior art, as disclosed in above-mentioned U.S. Patent No. 4,944,197, the main section ratios are selected and implemented manually by a shift lever, splitter shifts are manually selected by operation of a manual selector lever or button, often located on the shift lever or built into the shift knob, and are implemented by a remote two-position actuator. The range shift is manually or automatically selected and implemented by a remote two-position actuator. A separate range control button/lever may be provided, or, as illustrated in Figure 2, a lever operated "double H" type control may be utilized. Range and splitter actuators and controls of this type are well known in the prior art as may be seen by reference to U.S. Patent No. 4,788,889.

The prior art shift pattern for shifting transmission 10 is schematically illustrated in Figure 2. Divisions in the vertical direction at each gear lever position signify splitter shifts while movement in the horizontal direction from the three/four and five/six leg of the H pattern to the seven/eight and nine/ten leg of the H pattern signifies a shift from the low range to the high range of the transmission. As discussed above, splitter shifting is accomplished in the usual manner by means of a vehicle operator actuated splitter button or the like, usually a button located at the shift lever knob while operation of the range clutch shifting assembly is an automatic response to movement of the gear shift lever between the central and rightwardmost legs of the shift pattern as illustrated in Figure 2 and will- be described in greater detail below. Range shift devices of this general type are known in the prior art and may be seen by reference to above-mentioned United States Patent Nos. 3,429,202; 4,455,883; 4,561,325 and 4,663,725.

Referring again to Figure 2, and assuming that it is desirable that a transmission have generally equal ratio steps, the mainsection ratio steps should be generally equal, the splitter step should be generally equal to the square root of the mainsection ratio steps and the range step should equal about the mainsection ratio step raised to the N power where N equals the number of mainsection ratio steps occurring in both ranges (i.e., N=2 in the (2+1) X (2x2) transmission 10). Given the desired ideal ratios, gearing to approximate these ratios is selected. In the above example, the splitter steps are about 33.3% while the range step is about 316% which is generally suitable for a "2+1" main transmission section having about 78% steps as the square root of 1.78 equals about 1.33 and 1.78 raised to the second power (i.e. N equals 2) equals about 3.16.

The shift bar housing is provided with an opening 110 for receipt of a shift finger (not shown) carried by a shift lever or an X-Y device or the like.

To accomplish a shifting of the range section of the transmission 10 to achieve high range operation thereof, synchronized clutch assembly must be shifted to the leftwardmost position thereof as illustrated in Figure 1. To accomplish this without requiring the operator to actuate any control device other than the gear lever movements to the rightwardmost leg of the shift pattern as seen in Figure 2, the range control valve assembly 150 is provided. Briefly, a spring biased plunger member 156 connected to a master control valve 158 is axially

aligned with the grooved portion 154 of a shift mechanism and, when forced radially outwardly causes the master valve 158 to provide a signal to a slave valve 160 located at piston assembly 90 to shift the shift fork 88 leftwardly as is shown. Positioning of the control shaft 100 the low range position causes the plunger 156 to extend radially inwardly causing the master valve 158 to signal the slave valve 160 to shift the shift fork rightwardly from the position shown in Figure 1 to achieve a low range mode of operation.

According to the present invention, the shifting of transmission 10 is semi-automatically implemented by the semi-automatic transmission system 170, illustrated in Figure 4. A compound type transmission 10 comprising a main section 12 coupled to an auxiliary section 14 controlled by the shift control system/method of the invention is seen in Figure 4. Main section 12 is operatively coupled to the drive shaft of the vehicle engine (not shown) by clutch 172 and output shaft 58 of auxiliary section is operatively coupled, commonly by means of a drive shaft, to the drive wheels of the vehicle (not shown).

The change gear ratios available from main transmission section 12 are manually selectable by first depressing clutch pedal 174 to disengage the engine drive shaft and then positioning the shift lever 175 according to the shift pattern prescribed to engage the particular change gear ratio of main section 12 desired.

The shift control system/method of the invention is operative to initiate and enable automatic shifting between the sequentially related gear ratios within each main section grouping. The control system of the invention includes means for sensing and providing a suitable signal 176 to means operative to enable automatic shifting at the particular gear position desired. The means operative to enable automatic shifting includes logic circuitry 178, possibly clutch control 180, auto fuel control 182 and shift actuator 184. Logic circuitry 178 is preferably microprocessor based and is operative to receive and operate upon information including input speed signal 186, possibly a gear ratio position signal 176, output speed 188, and accelerator pedal position 190 to initiate and provide automatic splitter shifting as required by the invention. Generally, automatic shifting is accomplished by shift actuator 184 including valves and the like well known to those skilled in the art according to the nature of a command output signal 192 are received from logic circuitry 178 which, in turn, provides command output signal 196 to automatic fuel control 182 relative manual operation of accelerator pedal 190 in addition to information concerning output speed of output shaft provided logic circuitry 178 by sensor 200. A command output signal 194 to clutch control 180 for automatic operation of clutch 172 may also be provided but is not necessary.

The above described means by which automatic shifting is effected is well known to those skilled in the art excepting that it becomes operable only when any gear ratio included in the group of splitter gear ratios for a particular main section gear ratio is manually engaged by the operator. Examples of such automatic shifting may be appreciated in greater detail by reference to U. S. Patent Nos. 4,361,060; 4,527,447; and 3,478,851.

The shift logic unit may be of the type disclosed in U.S. Patent No. 4,595,986.

The shift pattern for transmission system 170 is illustrated in figure 3. As may be seen, upon manual selection of the low range third speed main section position or group 202, both the low ("L") and high ("H") splitter ratios are automatically provided. "3L" and "3H" in Figure 3 correspond to ratios "5" and "6" of the prior art shift pattern of Figure 2.

Shifting from the 202 position to the high range, second speed main section position or group 204, will involve a "double H" type range shift and will make both "4L" and "4H" automatically available. The "4L" and "4H" ratios, respectively, correspond to ratios "7" and "8", respectively, illustrated in Figure 2.

Once the operator manually selects one of the splitter groups, 1, 2, 3 (202), 4 (204) or 5, the system will automatically select the particular splitter ratio ("H" or "L") within that group that is most desirable and will automatically engage that ratio.

Figures 5 and 6 schematically illustrate a 10-speed splitter only type compound transmission 210 comprising a five forward speed main transmission section 22 and a two-speed splitter type auxiliary transmission section 214. The prior art shift pattern for transmission 210 is illustrated in Figure 6. The prior art transmission utilized a shift lever 272 cooperating with a shift bar assembly 270 and shift forks 260, 262 and 264 to control the main section and an auxiliary actuator 296 and shift fork 294 to control the auxiliary splitter clutch 290. A button 298 on the shift lever and a master valve (not shown) controlled the auxiliary slave actuator 296.

By utilizing a semi-automatic transmission system similar to system 170 illustrated in Figure 4 to control transmission 210 for automatic splitter shifting, the shift pattern of Figure 7 is obtained.

It is noted that the shift pattern of Figure 3, and especially of Figure 7, achieved by utilizing the control method/system of the present invention provides shifting of compound transmissions with the ease of shifting simple passenger car manual transmissions.

Claims

1. A shift control system (170) for a mechanical splitter type compound vehicular transmission (10) having a main section (12) connected in series with an auxiliary section (14) including combined range and splitter gearing, said main section including positive clutches (48,50) selectively manually engaged and disengaged by means of a shift lever (175) having a plurality of shift lever positions for selectively engaging and disengaging selected main section ra-

tios, said auxiliary section including positive clutches for selectively engaging and disengaging selected splitter section ratios, said transmission having a plurality of groups of forward gear ratios, each of said groups being manually selectable by an operator, corresponding to a particular transmission main section ratio corresponding to a unique shift lever position, and including a plurality of sequentially related gear ratios, said control system characterized by:

actuator means (184) enabling automatic shifting between the sequentially related gear ratios within said groups, said control system operable to command the actuator means to effect automatic shifting between the sequentially related gear ratios within said selected groups when one of said groups is manually selected by the operator, and means for sensing manual selection of a range shift and for automatically implementing a selected range shift.

2. The system of claim 1 wherein said main transmission (12) and said auxiliary section (14) have range and splitter type gearing.

3. A shift control method for semi-automatic shifting of a mechanical splitter type compound vehicular transmission (10) said transmission having a main section (12) connected in series with an auxiliary section (14) including splitter gearing, said main section including positive clutches (48,50) selectively manually engaged and disengaged by means of a shift lever (175) for selectively engaging and disengaging selected mainsection ratios said transmission having a plurality of groups of forward gear ratios with each of said groups being manually selectable by an operator, corresponding to a particular transmission main section ratio and including a plurality of sequentially related gear ratios,
said method characterized by:

said transmission including actuator means enabling automatic shifting between the sequentially related gear ratios within said groups, and
said control system including means for sensing when one of said groups is manually selected by the operator,
sensing selection of a particular group of ratios by the vehicle operator, and
causing automatic shifting between the sequentially related ratios within each of said selected groups.

Patentansprüche

1. Schaltsteuersystem (170) für ein mechanisches Fahrzeugverbundgetriebe (10) der Splittbauart, mit einer Hauptgetriebegruppe (12), die mit einer Hilfsgetriebegruppe (14) hintereinander angeordnet ist, die ein kombiniertes Range- und Splittgetriebe enthält, wobei die Hauptgetriebegruppe formschlüssige Kupplungen (48, 50) aufweist, die mittels eines Schalthebels (175), der mehrere Schalthebelpositionen zum willkürlichen Ein- und Ausrücken ausgewählter Hauptgruppengangstufen aufweist, manuell willkürlich ein- und ausgerückt werden, wobei die Hilfsgruppe formschlüssige Kupplungen zum willkürlichen Ein- und Ausrücken gewählter Splittgruppengangstufen aufweist, wobei das Getriebe mehrere Gruppen von Vorwärtsgängen hat, wobei jede Gruppe, die von einem Fahrer manuell auswählbar ist, einem speziellen Hauptgruppengang entspricht, einer speziellen Gangschalthebelposition entspricht und mehrere aufeinander folgende Gangstufen enthält, wobei das Steuersystem gekennzeichnet ist durch:

ein Aktuatormittel (184), das ein automatisches Schalten zwischen aufeinanderfolgenden Gangstufen innerhalb der Gruppe gestattet, wobei das Steuersystem dazu dient, dem Aktuatormittel zu befehlen, das automatische Schalten zwischen den aufeinanderfolgenden Gangstufen innerhalb der ausgewählten Gruppen zu gestatten, wenn von dem Fahrer eine der Gruppen manuell ausgewählt wird, sowie durch Mittel zum Erfassen der manuellen Auswahl eines Range-Schaltvorgangs und zum automatischen Durchführen eines ausgewählten Range-Schaltvorgangs.

2. System nach Anspruch 1, bei dem die Hauptgetriebegruppe (12) und die Hilfsgetriebegruppe (14) Getriebe der Range- und Splitterbauart aufweisen.

3. Schaltsteuerverfahren zum halbautomatischen Schalten eines mechanischen Fahrzeugverbundgetriebes (10) der Splittbauart, wobei das Getriebe eine Hauptgetriebegruppe (12) aufweist, die mit einer ein Splittgetriebe enthaltenden Hilfsgetriebegruppe (14) hintereinander angerordnet ist, wobei die Hauptgetriebegruppe formschlüssige Kupplungen (48, 50) aufweist, die mittels eines Schalthebels (175) zum willkürlichen Ein- und Ausrücken gewählter Hauptgruppengangstufen manuell willkürlich ein- und ausrückbar sind, wobei das Getriebe mehrere Vorwärtsganggruppenstufen aufweist, wobei jede Gruppe durch einen Fahrer manuell auswählbar ist, einer speziellen Hauptgruppengangstufe entspricht und mehrere aufeinanderfolgende Gangstufen enthält, wobei das Verfahren dadurch gekennzeichnet ist:

dass das Getriebe Aktuatormittel enthält, die ein automatisches Schalten zwischen den aufeinanderfolgenden Gangstufen innerhalb der Gruppe gestatten, und dass das Steuersystem

Mittel aufweist, die erfassen, wenn durch den Fahrer eine der Gruppen manuell ausgewählt ist,

dass die Auswahl einer speziellen Gangstufengruppe durch den Fahrzeugführer erfasst wird, und

dass innerhalb jeder ausgewählten Gruppe ein automatisches Schalten zwischen den aufeinanderfolgenden Gangstufen veranlasst wird.

Revendications

1. Système de commande de changement de vitesses (170) pour une transmission à relais mécanique (10) pour véhicules de type à pignons de demi-vitesses comportant une section principale (12) reliée en série à une section auxiliaire (14) comprenant des engrenages de vitesses et de demi-vitesses combinés, ladite section principale comprenant des embrayages positifs (48, 50) pouvant être mis en prise et libérés manuellement, de manière sélective, au moyen d'un levier de vitesses (175) comportant une pluralité de positions de leviers de vitesses pour mettre en prise et libérer, de manière sélective, les rapports de la section principale sélectionnés, ladite section auxiliaire comprenant des embrayages positifs pour assurer la mise en prise et la libération, de manière sélective, de rapports de section de pignons de demi-vitesse sélectionnés, ladite transmission comportant une pluralité de groupes de rapports d'engrenages de marche avant, chacun desdits groupes pouvant être manuellement sélectionné par un opérateur, correspondant à un rapport particulier de la section principale de transmission et correspondant à une position unique de levier de vitesses et comprenant une pluralité de rapports d'engrenages liés de manière séquentielle, ledit système de commande étant caractérisé par:

   des moyens d'actionnement (184) permettant le changement de vitesses automatique entre les rapports d'engrenage liés de manière séquentielle dans lesdits groupes, ledit système de commande pouvant être actionné pour commander le moyen d'actionnement pour assurer le changement de vitesses automatique entre les rapports d'engrenages liés de manière séquentielle dans lesdits groupes sélectionnés lorsque l'un desdits groupes est manuellement sélectionné par l'opérateur, et des moyens pour détecter la sélection manuelle d'une changement de vitesses et pour assurer automatiquement un changement de vitesses sélectionné.

2. Système selon la revendication 1, caractérisé en ce que ladite transmission principale (12) et ladite section auxiliaire (14) comportent des engrenages de type à vitesses et à demi-vitesses.

3. Procédé de commande de changement de vitesses pour assurer le changement de vitesses semi-automatique d'une transmission à relais mécanique (10) pour véhicules de type à pignons de demi-vitesses comportant une section principale (12) reliée en série à une section auxiliaire (14) comprenant des engrenages de demi-vitesses, ladite section principale comprenant des embrayages positifs (48, 50) pouvant être mis en prise et libérés manuellement, de manière sélective, au moyen d'un levier de vitesses (175) pour mettre en prise et libérer, de manière sélective, les rapports de la section principale sélectionnés, ladite transmission comportant une pluralité de rapports d'engrenages de marche avant, chacun desdits groupes pouvant être manuellement sélectionné par un opérateur correspondant à un rapport particulier de la section principale de transmission et comprenant une pluralité de rapports d'engrenages liés de manière séquentielle, ledit procédé étant caractérisé en ce que:

   ladite transmission comprend des moyens d'actionnement permettant le changement de vitesses automatique entre les rapports d'engrenages liés de manière séquentielle dans lesdits groupes, et ledit système de commande comprend des moyens pour détecter lorsque,
   l'un desdits groupes est sélectionné manuellement par l'opérateur,
   on effectue la détection de la sélection d'un groupe particulier de rapports par l'opérateur du véhicule, et
   le changement de vitesses est assuré automatiquement entre les rapports liés de manière séquentielle dans chacun desdits groupes sélectionnés.

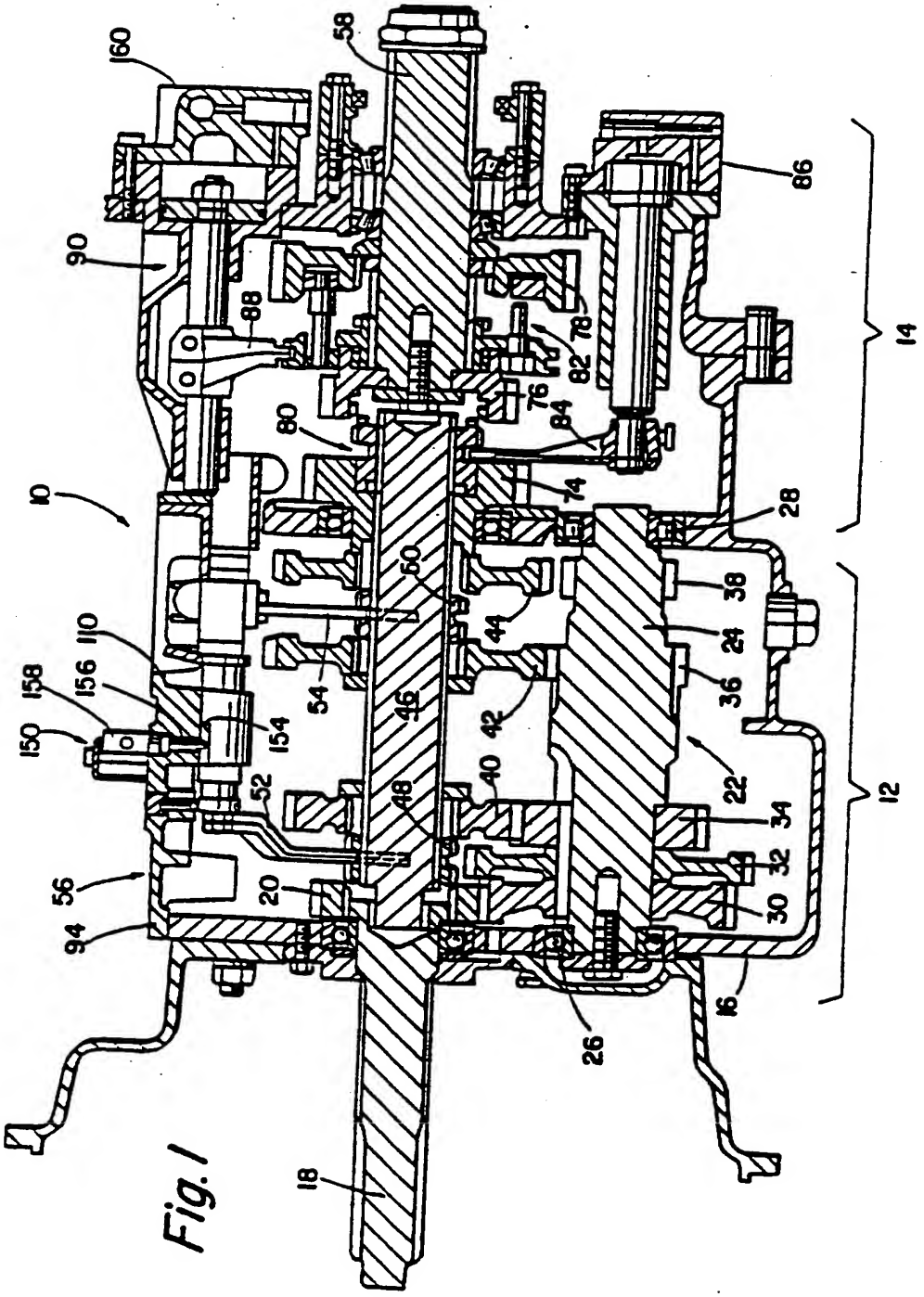
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Fig. 1

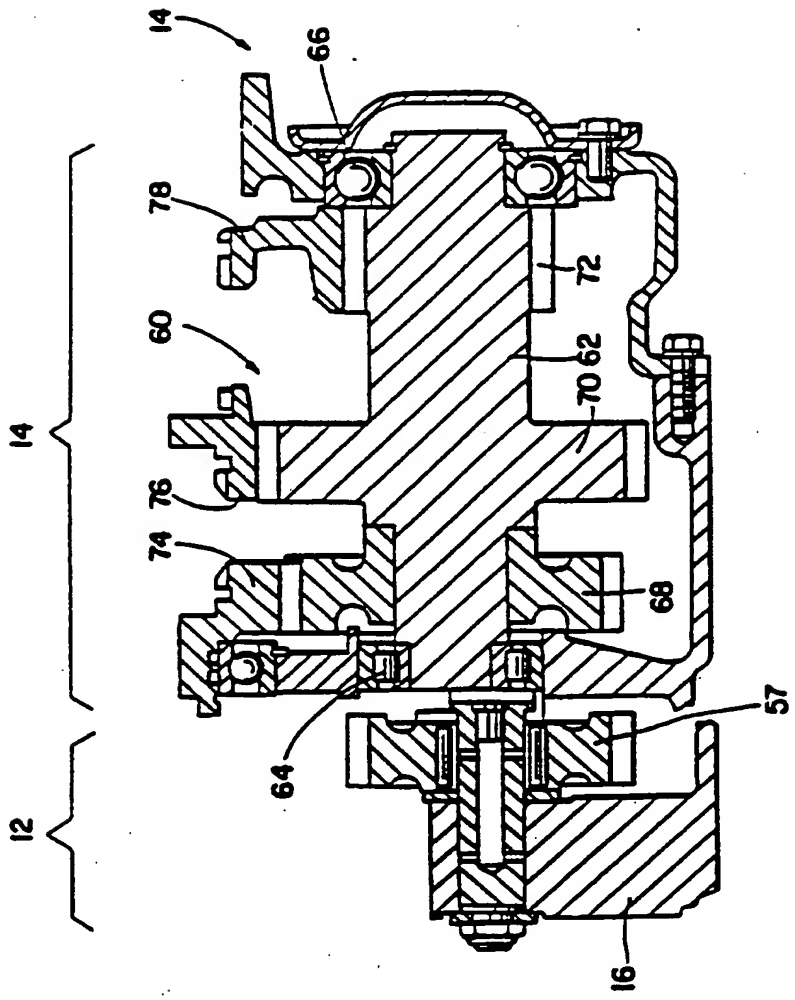

Fig. 1A

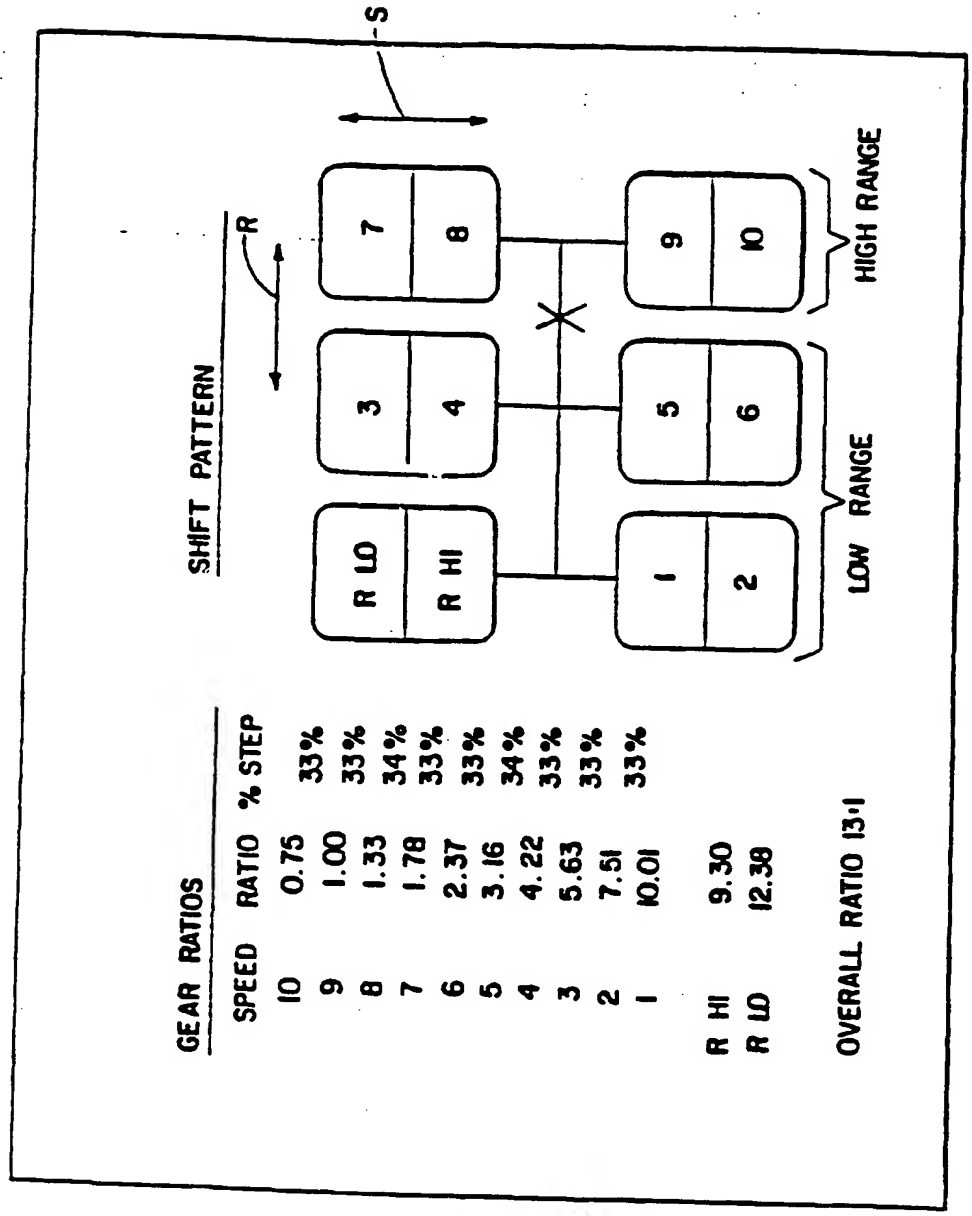

Fig. 2
PRIOR ART

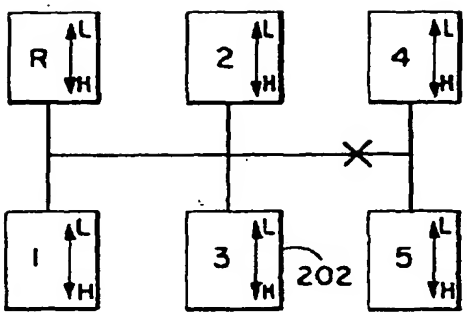

Fig. 3

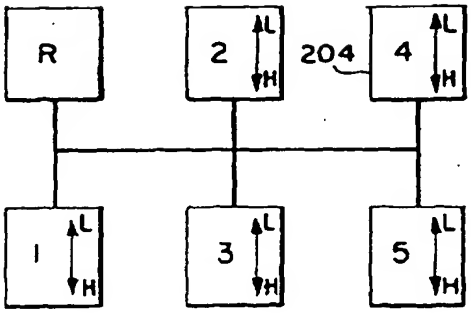

Fig. 7

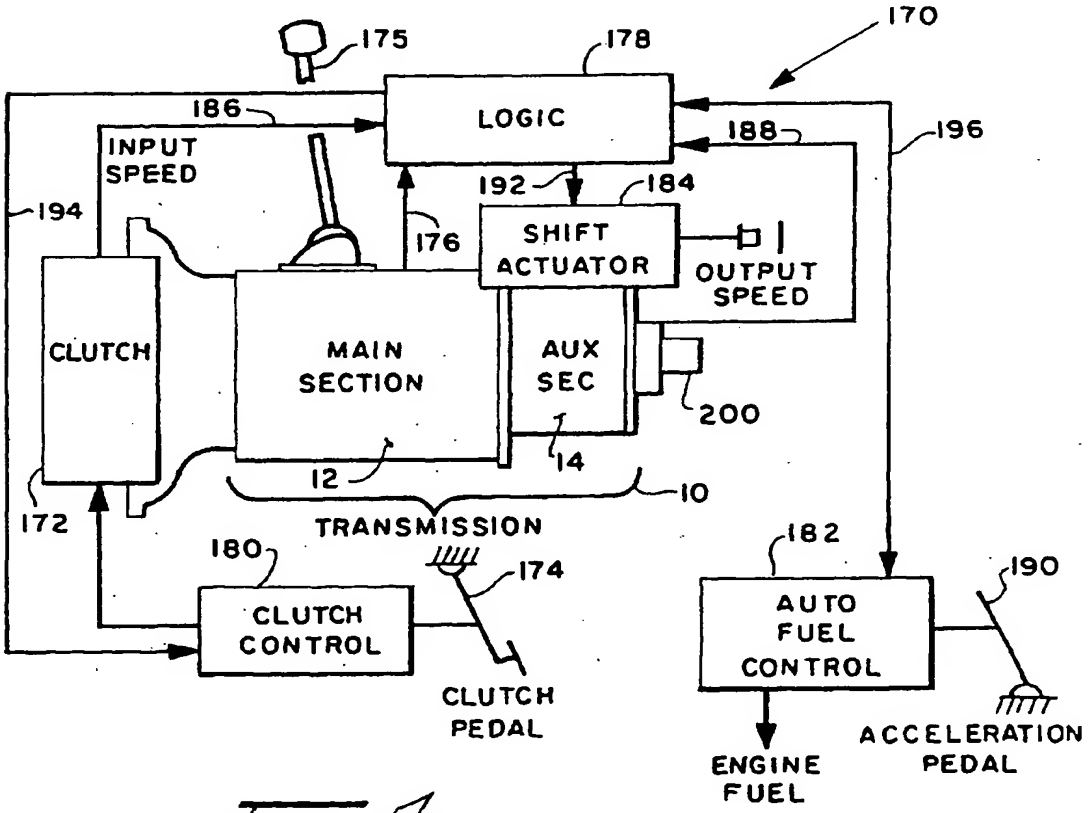

Fig. 4

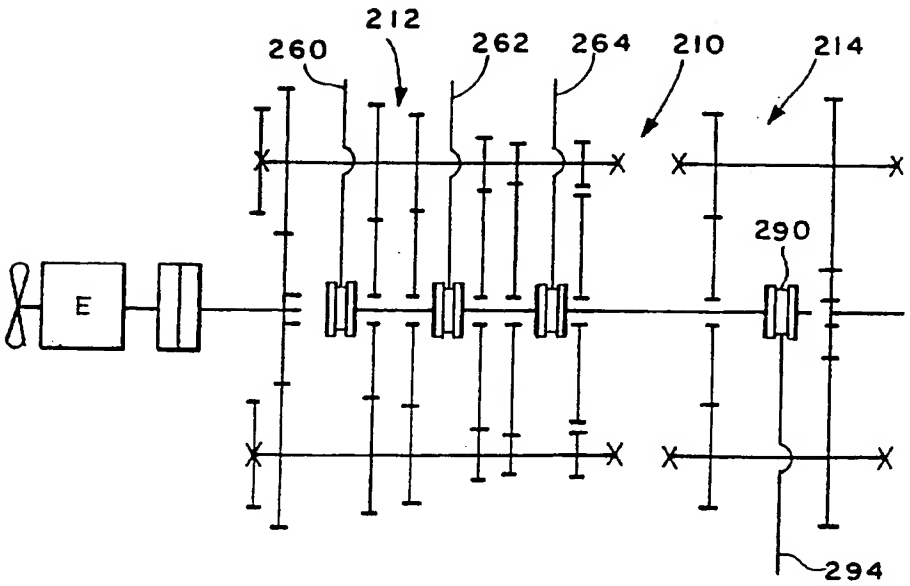

Fig. 5

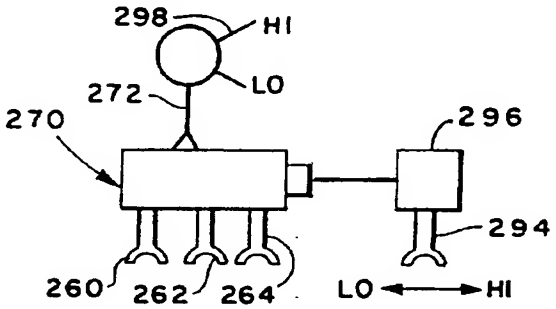

Fig. 5A

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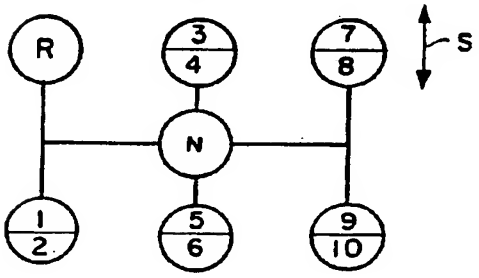

Fig. 6

PRIOR ART